

MEMORANDUM FOR: Deputy Director for Administration

FROM : James H. McDonald
Director of Logistics

SUBJECT : Report for Yearend Funding for Salt Shed
Replacement

1. This memorandum is to request FY 1976 yearend funding for replacement of the Salt Shed in the West Parking Lot at the rear of the Powerplant. It is presently budgeted for action in FY 1978 in the amount of \$75,000.

2. The present shed is of cinderblock, wood, and sheet metal construction. The interior is used primarily for bulk storage of sodium chloride with a small portion set aside for electrical controls for the parking lot lighting. Sand is stored in a bin on the west wall of the shed.

3. The problem with the existing facility is multifaceted. The building at best would be unattractive, but in its poor state of repair is ostensibly unacceptable. More important are the safety aspects relating to the busy, blind corner created by the three-way intersection, plus the wet, salty switchgear room which constitutes an electrical hazard. In addition to the above, considerable parking lot drainage runs off in the immediate vicinity with resultant leaching of chemicals away from the storage and into the storm drains.

4. The General Services Administration is currently engaged in executing a circa 1969 project to upgrade the West Parking Lot lighting at which time the electrical devices will be removed from this shed. The Real Estate and Construction Division, OL, has identified an elevated storage bin to be located in the Powerplant area which will hold sufficient material and make it possible for spreader trucks to be gravity loaded. Other means and locations for relocating the Salt Shed were considered but were either labor or mechanically intensive or inconveniently situated for operational requirements. A study detailing considerations for Salt Shed relocation and recommending an elevated storage bin is attached for your information.

SUBJECT: Report for Yearend Funding for Salt Shed Replacement

5. In view of the problems of safety and appearance cited in paragraph 3 above, plus the fact that the situation can only worsen with the passage of time, it is recommended that this project be included on any priority listing prepared for disposition of yearend funds should such be available in FY 1976. In addition to the \$75,000 required for construction, an estimated \$5,000 will be required for an architectural-engineering contract to design the facility. This can be funded from within the existing FY 1976 Engineering Support allocation.

James H. McDonald

Att

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ROAD ICE CONTROL CHEMICAL
STORAGE FACILITIES STUDY

PRELIMINARY REPORT

Prepared by:

Headquarters Engineering Branch, RECD/OL

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- Attachment B - Photographs of existing facility
- Attachment C - Types of overhead bin type storage structure
- Attachment D - Manufacturers data (including price quotation)
on recommended storage bin
- Attachment E - Recommended site plan and side elevation drawing

PRELIMINARY REPORT ON: ROAD ICE CONTROL
CHEMICAL STORAGE FACILITIES STUDY

I. GENERAL DISCUSSION

In January 1976, subject study was initiated to develop an alternate solution to the several proposed relocation schemes of the present Ice Control Chemical (Salt) storage facility from the present building located at the southeast corner of the West Parking Lot.

All said proposals recommend either construction of the same type of facility at other sites or adaptation of other facilities for salt storage use.

The difficulty in selecting an acceptable site for the in-kind replacement facility stemmed primarily from its relatively large area requirement for truck loading operation and difficulty of effectively camouflaging such type industrial activity from either adjoining properties or the main building. The few areas where this could be accomplished presented access problems such as operationally unacceptable steep grades or, as in the case of location adjacent to the existing sewer pumping station, indirect access via county and state roads through residential areas.

The only existing facility that could be made available and be adapted/alterd for salt storage use is the covered parking facility adjacent to the Garage. It was recommended to enclose required number

days for the bulk salt storage requirements. This proposal was considered undesirable for the following reasons:

A. It would result in reduction of covered vehicle parking assets required for the maintenance garage operations.

B. The adjacent area between the structures and even at the end of the structures is considered insufficient for safe loading operation involving spreader trucks and front-end loaders. For proper loading operation, a loading ramp should be provided. Room for construction of such ramp does not exist.

C. The loading operation utilizing front-end loaders to load trucks from a bulk storage pile results in substantial contamination of the adjacent area with chemicals. Such condition is unacceptable in the midst of a Vehicle Maintenance Facility.

This study has enlisted the cooperation and received assistance from the Federal Highway Administration and Salt Institute. Extensive bibliography describing the latest thoughts on the subject was collected and was used as the basis for findings and recommendations. The listing of the bibliography used for this study is enclosed with this report as Attachment A.

Although the initial charter of the study was limited to the siting and design of the replacement chemical storage building, this study had to be expanded to include the entire spectrum of the Ice and Snow Control operation as the methods used for Ice/Snow Control determine the size and type of facility required. The storage facilities and the methods of operation are interdependent. Storage facilities limit the choice of methods and methods of operation determine the facility requirements.

In the following sections preliminary partial findings and recommendations are briefly described. The final report for said findings and recommendations shall be made in the final report. Certain preliminary observations are to be doublechecked to insure absolute accuracy.

II. PRELIMINARY FINDINGS AND RECOMMENDATIONS

A. USE CHEMICALS FOR ICE/SNOW CONTROL

1. Findings

Presently sodium chloride (salt) in heavy doses is used almost exclusively to maintain roadways in clear pavements condition. Peletized calcium chloride is used for clearing the sidewalks. Abrasives (sand), for all practical purposes, are not utilized.

Sodium chloride is the most economical, most effective and widely used ice control chemical to attain clear pavement conditions. Its' effects on environment and dangers due to contamination are minimal. The main environmental concerns are: contamination of the water supply and the minor effects on vegetation.

Calcium chloride contamination has lesser effects on water supply and similar effects on vegetation. It is; however, more expensive especially if purchased in bagged form (current practice).

2. Recommendations

As the clear pavement conditions are desirable and

icals cannot and should not be eliminated. However, by instituting operational controls, training of snow/ice control crews, establishment of advanced methodology of chemical application, calibration of equipment, etc., the amount of chemicals used could be substantially reduced achieving same results. The environmental impact of use of chlorides by the Agency is negligible as the surface runoff from its property discharges almost directly into the Potomac River only a few miles above the tidal limits. Because most of the paved areas and roadways are curbed and served by storm sewer systems the effects of chemicals on the vegetation by properly controlled application methods and procedures can be minimized.

B. TYPE OF CHEMICALS NEEDED FOR ICE/SNOW CONTROL

1. Findings

Problems of lumping of the bulk stored sodium chloride and freezing of the sandpile have been reported. This is primarily due to semiexposed storage of the sodium chloride as the door of the shed is normally open and part of the pile is totally exposed to weather (see photographs, Attachment B). Also it is suspected that sodium chloride procured for our use does not contain anti-lumping agents. Our sandpile is open to weather,

is in constant saturated state, and as no antifreeze agents are added, freezes during periods of cold weather when its use would be most beneficial.

2. Recommendations

Because of our relatively small requirements, and inadvisability of having mixing facilities, both from economical and land-use viewpoints, it is recommended that commercially available products and mixtures be used in snow/ice control. Sodium chloride treated with anti-lumping agents should be used for both roadway and sidewalk deicing. Bagged sodium chloride should be used only at entrances and steps. More emphasis should be placed to timely plowing and measured mechanical applications of deicing chemicals on roadways and the pedestrian walkways. Sand should be procured from suppliers with deicing agents (sodium chloride at 20:1 proportion) already mixed in. All materials should be stored in totally weatherproof facilities. Use of sand, because of its large quantities required for even limited effectiveness and its tendency to cause problems within the storm sewer systems, should be limited to the intersections and steep grades. Sand should be used as an additive treatment and not as a substitute for chemical treatment.

In order to accelerate deicing action of sodium chloride under the extreme cold conditions (below 20° F.) prewetting of sodium chloride with liquid calcium chloride solution is recommended. Only minor modifications to our presently owned

C. STORAGE FACILITIES

1. Findings

The present facility is inadequate from both economical and operational standpoints. It does not provide adequate weather protection for the ice/snow control material stock piles; truck loading operation is unwieldy and inefficient due to site limitations; shed configuration prevents utilization of old stock; difficult loading conditions exist due to lack of ramp, etc. In addition, the site is totally unacceptable from the esthetic viewpoint. The existence of electrical switchgear in close proximity of the chemicals could be construed to be a safety hazard.

The existing salt storage shed is approximately 20' X 50' block/frame building normally containing approximately 200 tons of bulk sodium chloride. There is evidence (the material in the back of the shed appears not to have been disturbed for a number of years) that the stock is more than adequate even under present high usage rates. The bagged material that is also stored within the shed is not used as it is inaccessible. New stock of bagged deicing material stored elsewhere is used for sidewalk and entry way deicing.

In a typical present operation front-end loader and a spreader truck is mobilized and brought to the material storage shed. While the front-end load operator loads the

truck, the truck driver knocks the lumped materials off the truck scattering around the site. Then while the truck driver operates the truck, the equipment operator rides in the back of the truck observing the discharge of chemicals (not required if equipment is properly maintained and calibrated).

2. Recommendations

In order to reduce the response time which is critical for effective ice/snow control, automating the loading operation is recommended. It is recommended that this would be accomplished by constructing elevated overhead hopper-type storage facility. Illustrations of this type of facility are attached hereto as Attachment C. This type of facility would eliminate the requirement for the front-end loader and its operator. After positioning the truck under the hopper, the truck driver could easily load the vehicle by operating the power assisted clamshell gates. Sand or salt at rates controlled by variations in gate openings would be deposited directly into the truck by gravity. Most important, it would allow salting operations to begin almost immediately and to reduce the overall time required to complete the entire operation. Such operation would be relatively clean, minimizing ground contamination, and thus, the cleanup requirements in the immediate vicinity.

It is estimated that, with the institution of con-

trolled chemical application rates and other controls to

eliminate excessive chemical usage, the annual calcium chloride requirement to maintain the roads and other paved areas in relatively adequate "clear pavement" condition is only about 75 tons. An additional 25 tons of sand treated with antifreeze agents should be maintained for additional treatment of dangerous areas. Tank storage and dispensing facilities for approximately 100 gallons of calcium chloride brine solution for prewetting of sodium chloride should also be provided.

In view that standard self-supporting steel bins meeting our storage capacity requirement are commercially available from several manufacturers their use is recommended. Use of standard manufactured product is considered more economical than any custom design built-in-place system. A brochure of such a prefabricated bin is attached as Attachment D. Recommended size and other features are circled. The bin is to have two compartments with two separate gates for storing and dispensing both salt and sand. Interior will be protected with an anticorrosive coating. Charging of the hopper would normally be accomplished once per year during the summer months. However, a conveyor system is recommended to charge the hopper as it would be too costly to set the structure totally into the hillside to allow direct loading from the delivery trucks (see drawings in Attachment E). Although many salt delivery trucks are equipped with pneumatic offloading equipment, we would still have a problem of resupplying our sand requirements without said conveyor system.

D. SITE REQUIREMENTS

1. Findings

As previously stated, the present site is totally unsatisfactory. The key elements of the site are as follows:

a. Safety - Good site distances and adequate equipment operational area. Access roads should not open directly into heavily used roads. Site should be relatively hazard free (especially of the hazards that may be covered with snow). The site should be adequately lighted and posted to warn motorists of truck traffic.

b. Accessibility - Storage site should permit easy access and maneuverability by trucks and other equipment used.

c. Tidiness - Storage facilities should be as unobtrusive and attractive as possible and be shielded from view of the nearby roads.

d. Drainage - The storage facilities should be adequately drained to prevent soil, surface, and sub-surface water contamination by the chemicals.

2. Recommendations

The proposed site as shown on Attachment E is ideal from several respects. The steep grade allows the facility to be built

into a hillside allowing not only for easy hopper charging and truck loading operation, but also to meet the low profile requirement of the present facilities planning policy. It is adjacent to an industrial site and with minimal architectural treatment it can be made to look like the powerplant or the cooling tower structures. Stucco treated panels inset or attached to the structural steel required to support the hopper and the roof over said hopper are recommended. The cost of providing access both for the supply trucks and for the salt spreading trucks from the Powerplant yard are minimal.

III. COST ESTIMATE

The following preliminary cost estimate for construction of recommended facility at the recommended site is provided for budget purposes. The Contractors profit, overhead, contingencies, and GSA fees are distributed and included in individual items.

<u>ITEM</u>	<u>COST</u>
NEW CONSTRUCTION	
Earthwork	\$ 8,000
Foundations and other concrete	9,000
Hopper*, Structural Steel, Calcium Chloride Tank	20,000
Hopper Charging System	7,500
Access Roads/Ramps	5,000
Electrical	3,000
Drainage	2,000
Roof and Architectural Treatment	10,000
General Site Work and Landscaping	<u>1,000</u>
SUBTOTAL NEW CONSTRUCTION	\$65,500
Demolition and Cleanup	5,500
Contingency	<u>4,000</u>
TOTAL	\$75,000

*Range Quotation received from General Supply and Equipment Co. of Merrifield, Virginia

IV. EQUIPMENT REQUIREMENTS

1. Findings

Thorough analysis of the present snow/ice fighting equipment assets has not been completed. The mechanical condition, sufficiency, adequacy, efficiency, and other factors are as yet to be delved into. However, the present equipment including salt spreading trucks can be used without modification in conjunction with the proposed salt/sand storage and loading facility.

2. Recommendations

Continue with the study and report findings and recommendations.

V. IMPLEMENTATION OF RECOMMENDATIONS

At this stage of the overall study only the implementation of the recommended salt storage facility can or should be discussed.

The overall scope of the project is such that the construction has to be accomplished by a contract. The bins and other related equipment could be purchased separately and provided to the contractor as G.F.M. This action is recommended as it would most likely result in savings, would enable us to use end of year funds if available, and would minimize the potential change orders to the construction contract resulting from minor differences in dimensions and configuration of the standard products as produced by different manufacturers. There are numerous manufacturers of said hoppers and we could not legitimately eliminate any one of them from consideration. Advance knowledge of the physical characteristics of the product chosen is almost absolutely required for development of construction drawings.

In-house design does not appear feasible. Estimated manpower requirements to prepare complete plans and specifications for construction contract are as follows:

Survey Crew (3 Men)	6 Mandays
Senior Project Engineer	30 Mandays
Architect	10 Mandays
Junior Engineer	20 Mandays
Draftsman	20 Mandays
Typist	5 Mandays
Electrical Engineer	5 Mandays
Mechanical Engineer	5 Mandays
TOTAL	101 Mandays

If the above manpower resources could be made available for in-house design, the contract could be awarded as early as 7 weeks from start of design work. Design by outside A-E firm would take a minimum of 8 - 9 weeks vice a maximum of 5 weeks for in-house. Minimum estimated construction time requirement is 60 days.

BIBLIOGRAPHY

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Manual for Deicing Chemicals: Storage and Handling, EPA-670/2-74-033, July 1974, by National Environmental Research Center, Office of Research and Development, U. S. Environmental Protection Agency, Cincinnati, Ohio 45268. Printed by U. S. Department of Transportation, Federal Highways Administration, Offices of Research and Development, Washington, D. C. 20590.

Winter Snow and Ice Control, by L. G. O'Brien, P.E., Director Pennsylvania Department of Transportation's Bureau of Maintenance. "PA Township" News Vol. 28, No. 9, September 1975.

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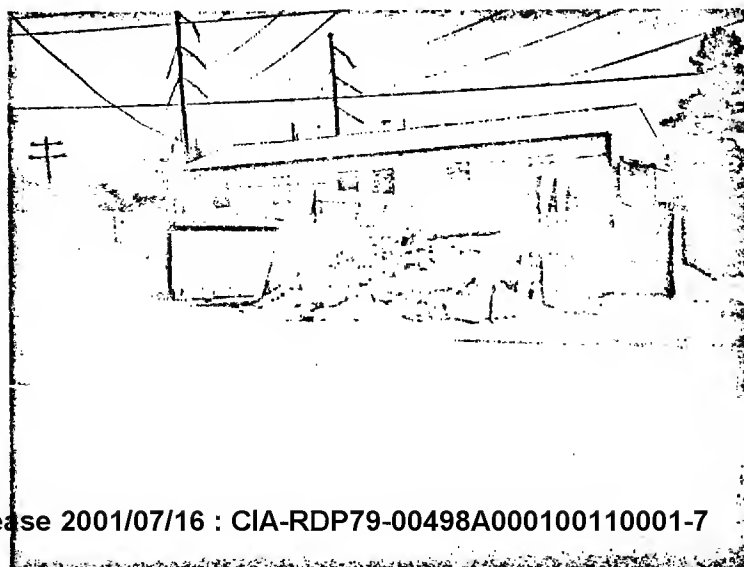
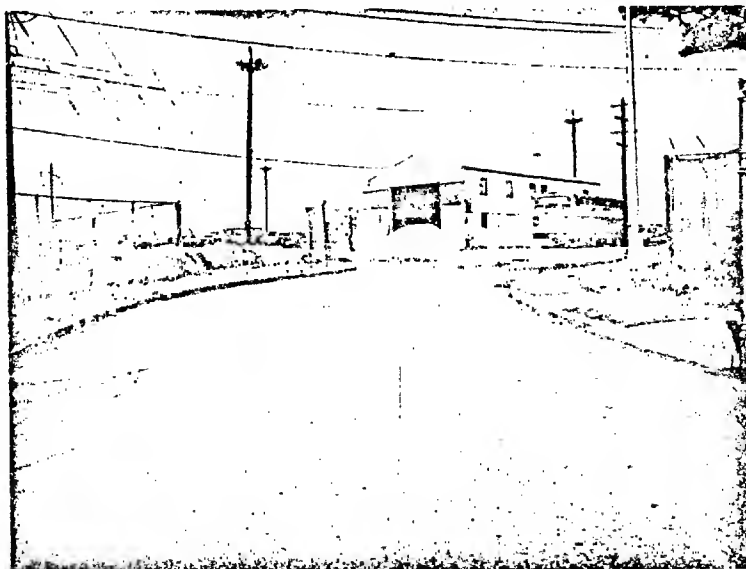
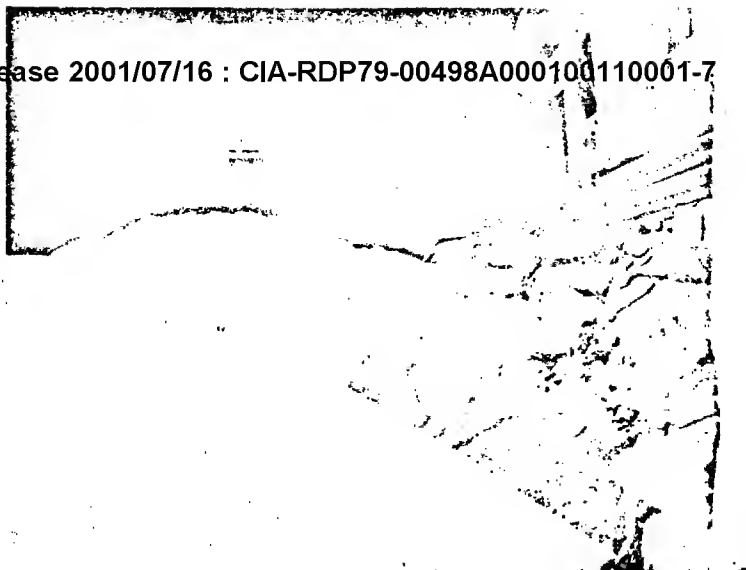
Snow and Ice Control Materials Storage and Handling, Report No. FHWA-RD-75-524 by U. S. Department of Transportation, Federal Highway Administration, Office of Development, Implementation Division, Washington, D. C. 20590

The Snowfighter's Handbook by the Salt Institute, Revised 1973, Published by Salt Institute, 206 N. Washington Street, Alexandria, Virginia 22314

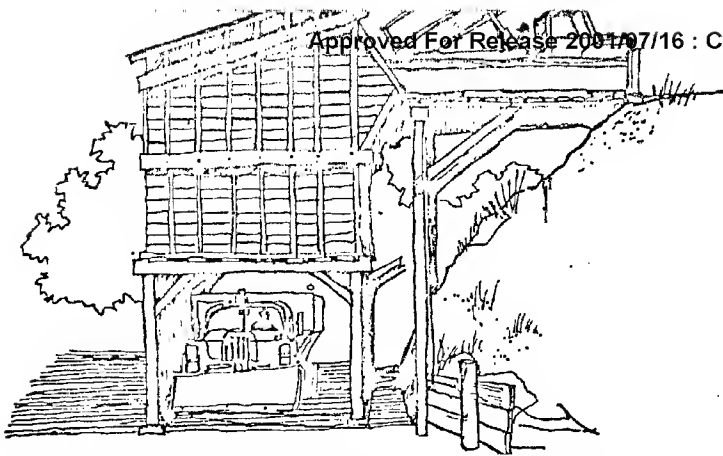
The Snowfighter's Salt Storage Handbook, by Salt Institute 1968 Edition, Published by Salt Institute, Alexandria, Virginia.

Snow Removal, U. S. Navy Technical Publication, NAVDOCKS TP-PW-29, 1 October 1973, Department of the Navy, Bureau of Yards and Docks, Washington, D. C.

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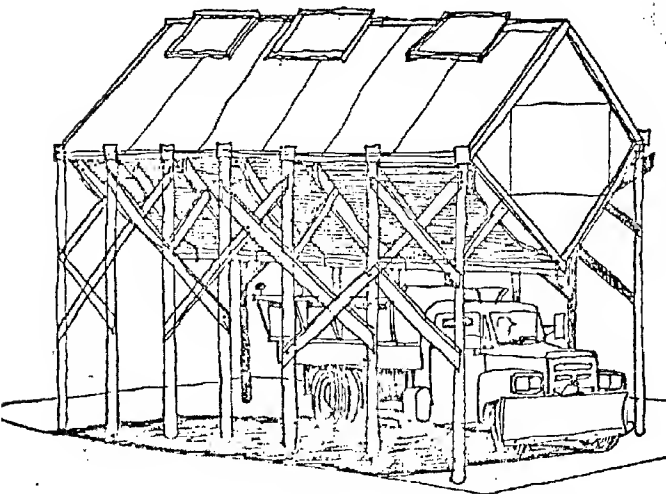


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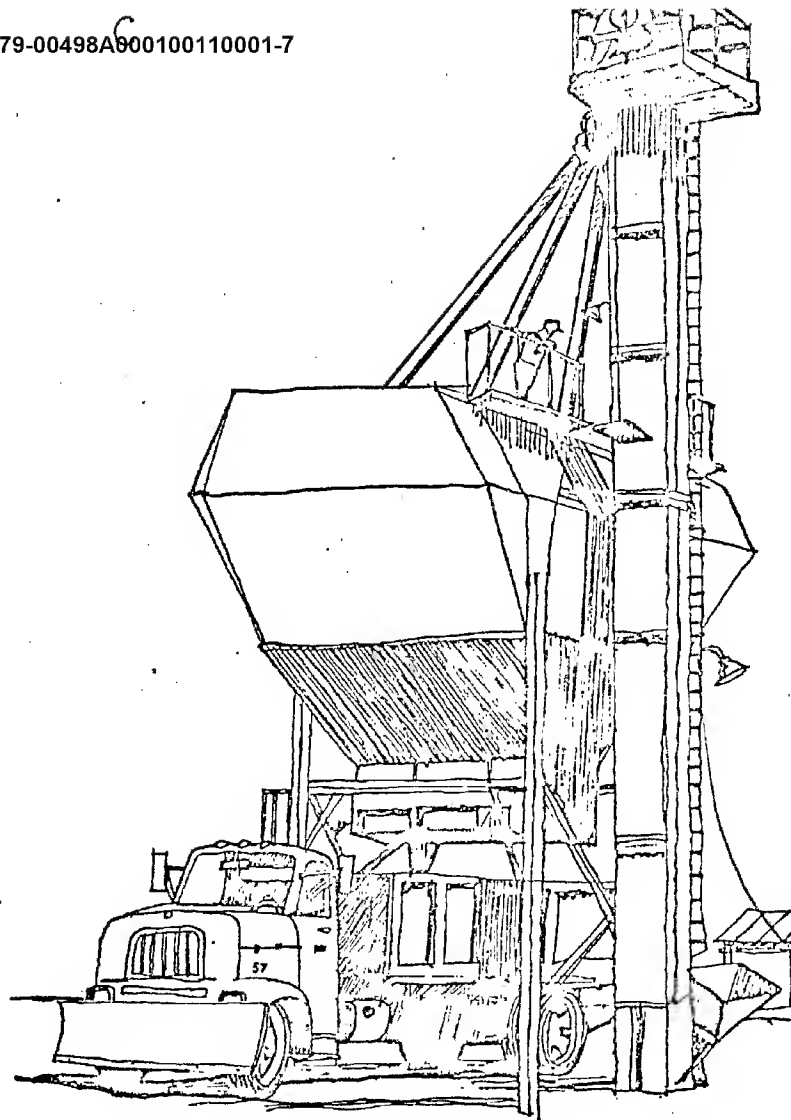
Wooden bin, located on hillside, can be charged from the top and discharged below directly into spreader trucks. One-man unloading is important. Use bridge timbers for this type of construction.

B

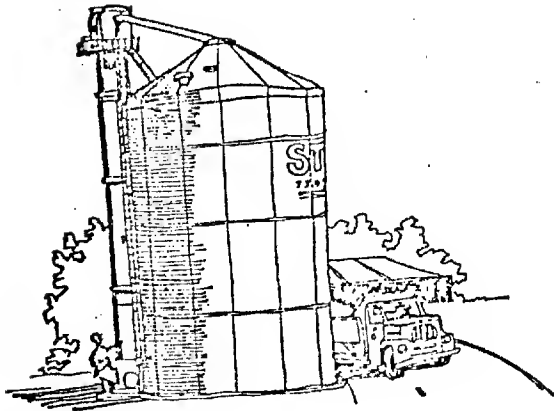


Bin can be turned this way to provide natural 45° slope to eliminate need for false bottom and conserve storage space.

A

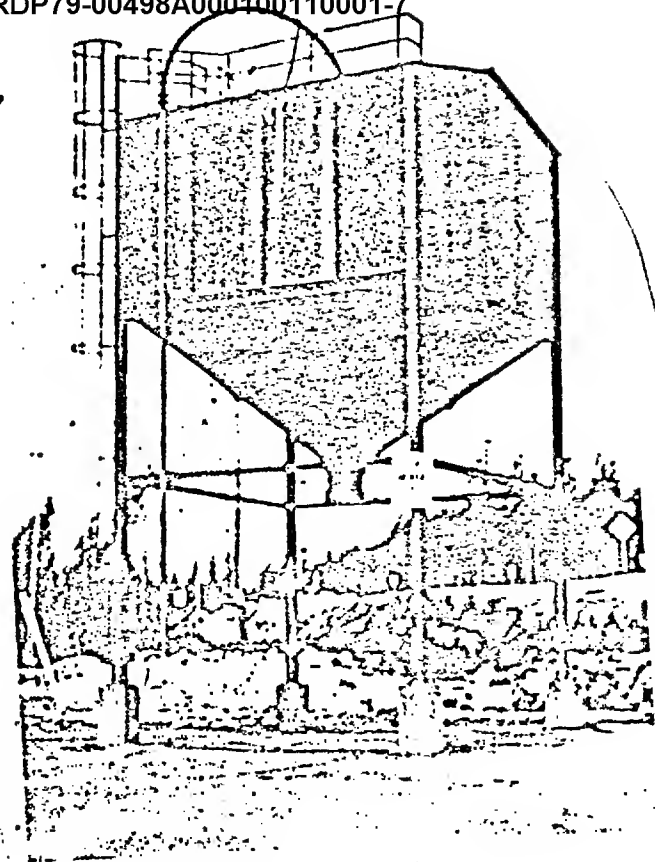


Standard metal bins provide good salt storage. They are available from manufacturers with various charging



Several types of silos — both concrete and steel
are available from manufacturers.

D



Alta-type 100-ton storage hopper
Courtesy of State of California
Department of Transportation

E

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SQUARE BINS



PORTEC inc.

BUTLER DIVISION

P.O. BOX 673

WAUKESHA, WIS. 53186

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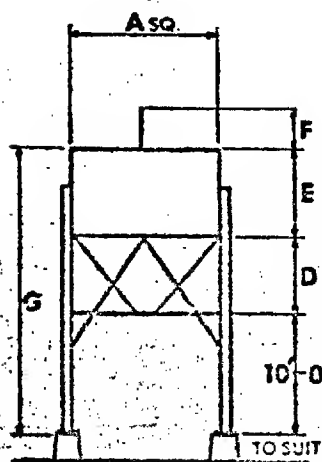
MODEL SA

SQUARE BINS

OPEN TOP

NON-ASSEMBLED

DIMENSIONS SHOWN FOR REFERENCE ONLY



50° SLOPED BOTTOM.

TYPE	CU.YDS. HEAPED	TONS HEAPED	A		D	E	F	G
SA70	74	110	13'		7'-4	7'-1	3'-9	24'-5
SA100	93	145	15'		9'-1	5'-1	4'-9	24'-2
SA145	143	213	16'		9'-1	9'-10	4'-9	29'-11
SA133	181	269	16'		9'-1	13'-10	4'-9	32'-11
SA303	303	450	23'		11'-6	13'-10	5'-9	35'-4

*BASED ON MATERIAL WEIGHING MAX. OF 110 LB./CU. FT.

COMPARTMENTATION



BIN MODEL SA

Structural design based on material weighing
110#/ft.³ and wind pressure at 25 P.S.F.
(70.7 M.P.H.)

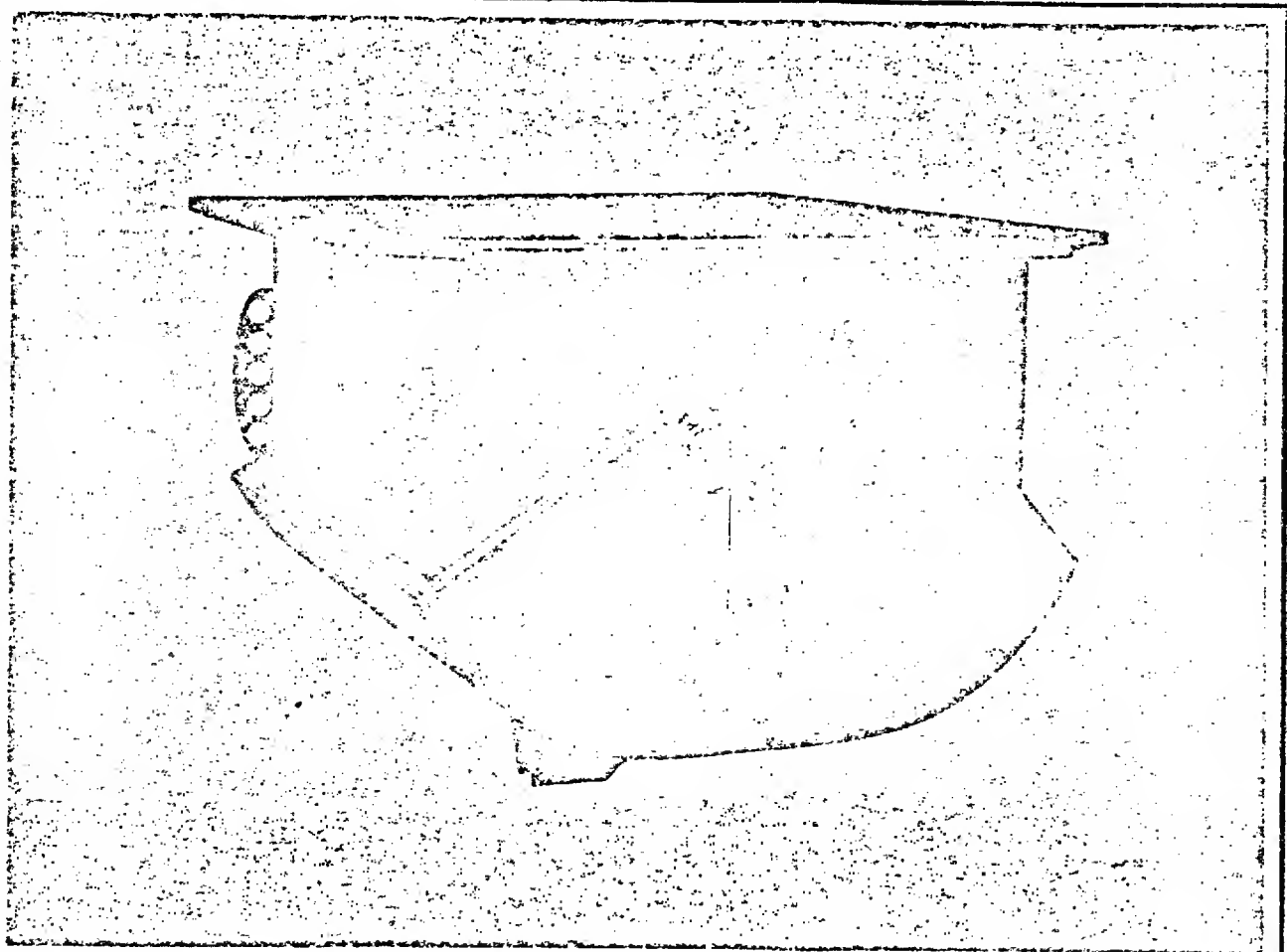
1 COMPARTMENT Standard
(Optional: 2, 3, 4 or 6
Compartment)

NOTE: To convert tons to metric tons multiply x 0.907.

(See Specification Sheets for Details)

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duplex gates

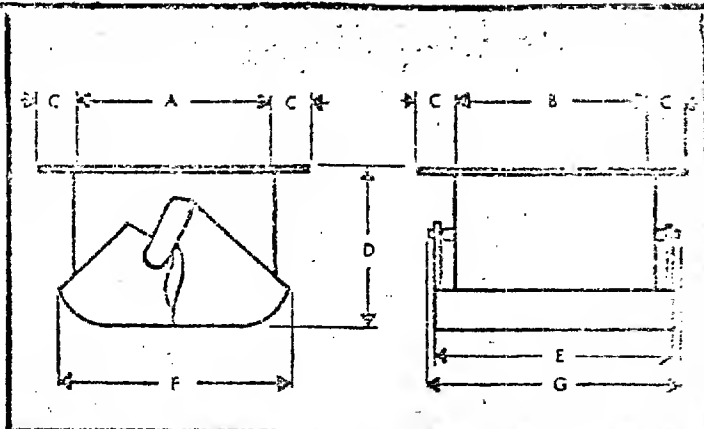


flow control for sand, gravel, rock, coal, fertilizers, chemicals and similar bulk materials

a size to fit most applications

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Duplex gates are offered in a number of sizes to fit most applications. They are precision fabricated of heavy plate, all welded construction with a unique design to cause the gate to stay closed until the opening action is started at which time the jaws fall away from the material without friction and providing a built-in ease of operation.

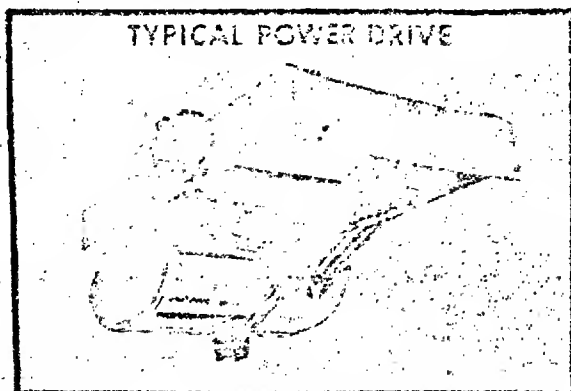


Sand
dimensions

Salt

GATE	12x12	12x15	15x12	15x15	15x10	15x24	10x10	24x24	30x20	35x25
A	1'-0	1'-0	1'-3	1'-3	1'-3	1'-3	1'-5	2'-0	2'-6	3'-0
B	1'-0	1'-3	1'-0	1'-3	1'-6	2'-0	1'-6	2'-0	2'-6	3'-0
C	2 $\frac{2}{3}$	2 $\frac{2}{3}$	2 $\frac{2}{3}$	2 $\frac{2}{3}$	2 $\frac{2}{3}$	2 $\frac{2}{3}$	2 $\frac{2}{3}$	2 $\frac{2}{3}$	2 $\frac{2}{3}$	3 $\frac{1}{2}$
D	1'-0	1'-0	1'-0	1'-0	1'-0	1'-0	1'-1 $\frac{1}{2}$	1'-0 $\frac{1}{2}$	1'-10 $\frac{1}{2}$	2'-0
E	1'-3 $\frac{1}{2}$	1'-6 $\frac{1}{2}$	1'-3 $\frac{1}{2}$	1'-6 $\frac{1}{2}$	1'-9 $\frac{1}{2}$	2'-0 $\frac{1}{2}$	1'-9 $\frac{1}{2}$	2'-3 $\frac{1}{2}$	2'-9 $\frac{1}{2}$	3'-0
F	1'-2	1'-2	1'-5 $\frac{1}{2}$	1'-5 $\frac{1}{2}$	1'-5 $\frac{1}{2}$	1'-5 $\frac{1}{2}$	1'-3 $\frac{1}{2}$	2'-1 $\frac{1}{2}$	2'-10 $\frac{1}{2}$	3'-0
G	1'-5 $\frac{1}{2}$	1'-9	1'-6	1'-9	2'-0	2'-6	2'-3	2'-6 $\frac{1}{2}$	2'-11 $\frac{1}{2}$	3'-0

a choice of manual or power operation



TYPICAL POWER DRIVE

MANUAL LEVER

If manual operation is desired, there is a choice between a single bar lever or extension levers directionally mounted to suit operators convenience.

PNEUMATIC

Air is most commonly used for power operation. It consists of a pneumatic cylinder including related air drive components.

HYDRAULIC

Similar to pneumatic except actuated by a hydraulic cylinder and self contained hydraulic pump drive.

NO GEARS TO JAM OR WEAR!! The toggle mechanism is simple positive and free of cog problems. Studs and pins are oversized for extra wear fitted with replaceable heavy duty sintered alloy bushings.

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